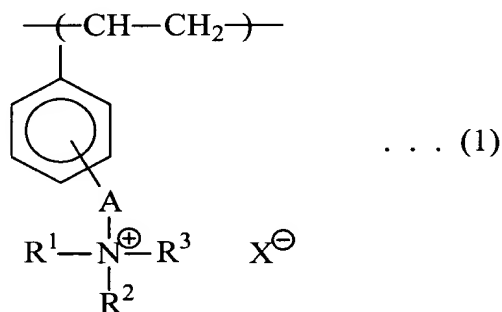


Claims 5-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over these same references further in view of MacDonald (U.S. 5,045,171).

Claim 10 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Terada et al, U.S. 5,759,373, taken with Tomoi et al, U.S. 5,350,523, and further in view of MacDonald, U.S. 5,045,171, as applied to Claims 1-9, 11 and 12 above, and further in view of Akao, U.S. 4,876,129, or Osterholtz, U.S. 3,846,521, or Sata et al, U.S. 4,169,023, or Saad et al, U.S. 6,306,646, or Chau et al, U.S. 4,775,474.

The invention, as defined by Claim 1, relates to an anionic exchange membrane comprising a resin phase which contains from 20 to 96 mass% of a polymer having repeating units represented by the following formula (1):



wherein A is a C₃₋₈ alkylene group or an alkyleneoxyalkyl group having a total carbon number of from 4 to 9, each of R¹, R² and R³ is a hydrogen atom, a C₁₋₆ alkyl group or a hydroxyalkyl group, and X⁻ is an anion, and wherein any hydrogen atom bonded to the benzene ring may be substituted by an alkyl group or a halogen atom, and from 4 to 80 mass% of a thermoplastic polymer having no ion exchange groups, mixed substantially uniformly.

As so specifically recited in Claim 1, the defined anion exchange resin and the thermoplastic polymer are "mixed substantially uniformly" in the membrane. This means, as so defined at page 5, lines 7-14, that when the resin phase is observed by an optical

microscope, the polymer of the formula (1) and the thermoplastic polymer having no ion exchange groups can not be distinguished, and phase separated structure containing phases having a size of more than 1 μm can not be observed. This is achieved only by using the claimed process for its preparation, i.e., wherein a thermoplastic polymer having no ion exchange groups is mixed with a polymerizable component comprising a monomer of the formula (2), as defined in Claim 5, and the polymerizable monomer is then polymerized while mixed with such thermoplastic polymer. Such process is not disclosed by Terada et al.

The method of Terada et al involves only mixing of preformed polymers, as note column 5, line 17 ff. In Terada at al, a heterogeneously mixed ion exchange membrane is obtained by mechanically mixing a powder of the polymer of the formula (1) and the thermoplastic polymer and forming the mixture into a membrane form by e.g. hot pressing. An inferior membrane is obtained thereby, since deterioration of the selective permeability of ions due to an increase of the concentration of the electrolyte is substantial. If such membrane is used for a long period of time at a high temperature or in a solution having a composition which swells the resin, deterioration of the selective permeability of ions or deterioration of the selective permeability of ions or deterioration of the membrane strength takes place. Note page 5 of the specification.

The Examiner recognizes this basic distinction, but urges that patentability of a product rests with the actual product formed as opposed to the method by which it is formed, Terada et al also teaching the use of a binder polymer solution, and that MacDonald remedies any possible inadequacy of Terada et al to make obvious Applicants' discovery.

It is submitted that the position taken by the Examiner is not well taken. Specifically, the methods disclosed by Terada et al at column 5, lines 17-30 involve only the making of a heterogeneous mixture of ion exchange resin and binder polymer, no substantially uniform

mixing, as defined, being obtained thereby. When a binder polymer solution is employed by Terada et al, the polymer is disclosed only to be coated on the surface of the ion exchange resin particles (column 5, lines 22-23), the binder polymer not becoming substantially uniformly mixed with the anion exchange resin thereby, as is required and necessary in the claimed invention. Manifestly a materially and significantly different product is obtained by the claimed process as compared to the product obtained by Terada et al.

Further, and in any event, Terada et al does not disclose an anion exchange membrane wherein the anion exchange resin is one as defined by the claims. As the polymer having an ion exchanging groups, as far as is relevant to the present invention, only polyvinylbenzyltrimethylammonium chloride is disclosed by Terada et al (column 5, lines 4-5). In the present invention, on the other hand, in the claimed polymer A is a C₃₋₈ alkylene group or an alkyleneoxyalkyl group having a total carbon number of from 4 to 9. The Examiner recognizes this distinction and thus additionally relies on Tomoi et al to assertedly further cure this deficiency.

It is submitted that such additional reliance on Tomoi et al to make obvious Applicants' discovery is rebutted for the following reasons. Preliminarily, the fact that an anion exchange resin as defined by the present claims is known, per se, as so disclosed by Tomoi et al, does not provide any motivation or reason for substituting such anion exchange resin for the anion exchanger of Terada et al, no motivation therefor being present. Only polyvinylbenzyltrimethylammonium chloride is disclosed by Terada et al as precursor for its anion exchange resin. No other anion exchange resins of this type are disclosed, only other significantly different anion exchange resins being taught by Terada et al.

Further, and in any event, Terada et al, not Tomoi et al, manifestly is the closest prior art, only this reference teaching a mixture, albeit heterogeneous, of an anion exchange resin

and a polymer binder. This closest prior art, however, has been directly compared with and shown to result in a product of inferior properties and characteristics. Note Comparative Example 3 in the case at page 20 of the specification. Tomoi et al manifestly is not the closest prior art, it only disclosing the anion exchange resin, per se, not as a mixture with a binder polymer.

With regard to MacDonald further relied upon by the Examiner, the following is again emphasized. While MacDonald teaches a method of polymerizing a functional monomer together with a thermoplastic film forming polymer to prepare a membrane, no polymerizable monomer as required by the claims is disclosed by this reference. Here again, only a monomer of vinylbenzyltrialkylammonium chloride is, *inter alia*, disclosed as suitable. However, as pointed out and discussed above, a membrane obtained by the use of such polymerizable monomer results in a significantly and materially inferior product.

With regard to Claim 10, the Examiner additionally relies on various cited references assertedly teaching that “irradiating thermoplastic polymers with electron beams or gamma-rays to optimize properties such as crosslinking, diffusion, hydrophilicity, adhesion, permeability etc.” is known. However, these additionally relied upon references manifestly do not relate to an anion exchange resin membrane of the nature as claimed resulting in additional unobvious improvements, as note page 14, lines 9-18 of the specification. Such additionally manifestly is unobvious even from the teachings of these further references.

Accordingly, withdrawal of the rejection of the claims under 35 U.S.C. §103(a) is requested.

It is submitted that this application is now in condition for allowance and which is solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Norman F. Oblon
Attorney of Record
Registration No. 24,618

Samuel H. Blech
Registration No. 32,082



22850

(703) 413-3000
Fax #: (703) 413-2220
SHB/rac
I:\atty\SHB\211758US-AF.wpd